3.2 Graphing Linear Equations

The **solution of an equation** in two variables x and y is an ordered pair (x, y) that **makes the equation true.**

The **graph of an equation** in x and y is the set of all points (x, y) that are **solutions of the equation.**

Determine whether each ordered pair is a solution of $x + 2y = 5$.

1. $(7, -3)$ not a solution
$7 + 2(-3) \stackrel{?}{=} 5$
$7 + -6 = 5$
$1 \neq 5$

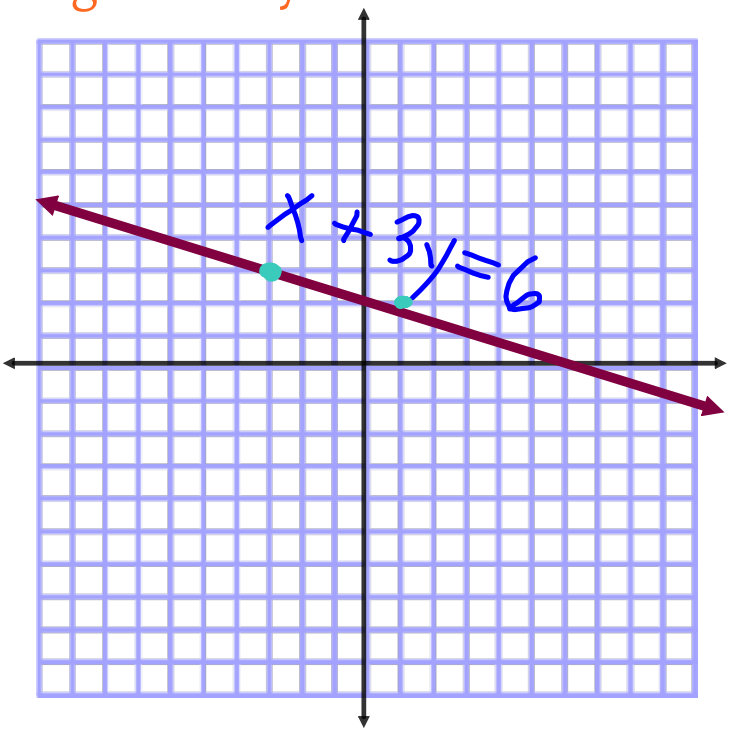
2. $(1, 2)$ solution
$1 + 2(2) \stackrel{?}{=} 5$
$1 + 4 = 5$
$5 = 5$ ✓

Determine whether each ordered pair is a solution of $2x + y = 1$.

3. $(\frac{1}{2}, 0)$ solution
$2(\frac{1}{2}) + 0 \stackrel{?}{=} 1$
$1 + 0 = 1$
$1 = 1$ ✓

4. $(\frac{5}{2}, -6)$ not a solution
$2(\frac{5}{2}) + (-6) \stackrel{?}{=} 1$
$5 + -6 = 1$
$-1 \neq 1$

Use the graph to decide whether the point lies on the graph of $x + 3y = 6$. Justify your answer algebraically.



5. (1, 2) not a sol.

x y

$1 + 3(2) \stackrel{?}{=} 6$

$1 + 6 = 6$

$7 \neq 6$

6. (-3, 3) solution

x y

$-3 + 3(3) \stackrel{?}{=} 6$

$-3 + 9 = 6$

$6 = 6\checkmark$

A linear equation is an equation that can be written in the form $Ax + By = C$, (x & y → on same side)
called **standard form**, where A, B, & C are numbers, and A and B are not both zero.

A two-variable equation is written in **function form** if one of its variables is isolated on one side of the equation.

Solve for y →

$y = 3x + 4$ is in function form

$2x + 3y = 6$ is **not** in function form

Write the equation above in function form.

$2x + 3y = 6$

$-2x \quad -2x$

$\frac{3y}{3} = \frac{-2x}{3} + \frac{6}{3}$

$y = -\frac{2}{3}x + 2$

Steps to Graphing a Linear Equation

Step 1: Rewrite the equation in **function form**.
get y by itself ←

Step 2: Choose a few values of *x* and make a table.
at least 4

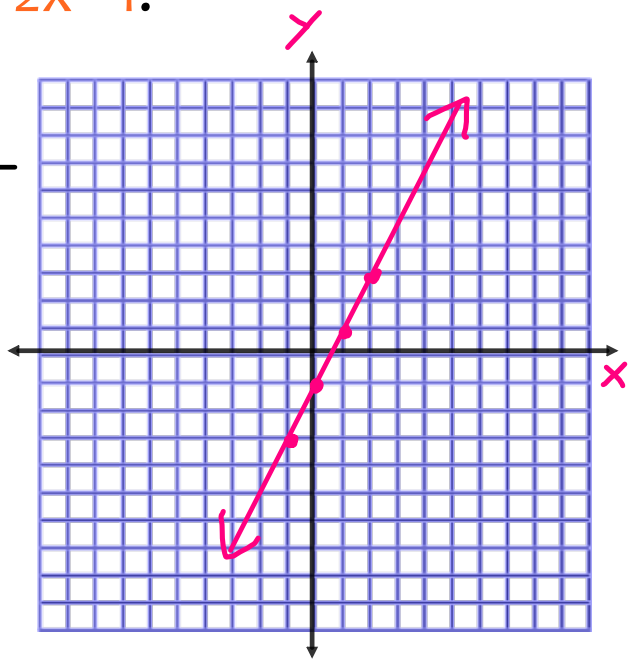
Step 3: Plot the points from the table of values. A line through these points is the graph of the equation.

Example 7

Draw the graph of $y = 2x - 1$.

$y = 2x - 1$

x		y
-1	$2(-1) - 1$, $-2 - 1$	-3
0	$2(0) - 1$, $0 - 1$	-1
1	$2(1) - 1$, $2 - 1$	1
2	$2(2) - 1$, $4 - 1$	3



Example 8

Draw the graph of $3x + 2y = 4$.

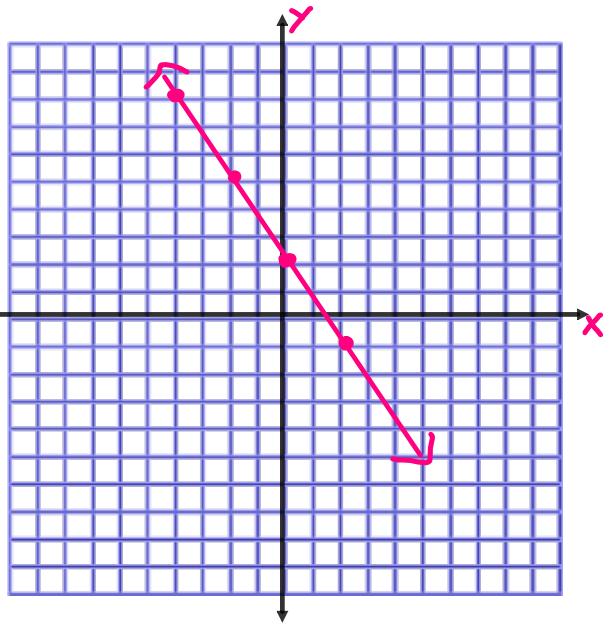
$3x + 2y = 4$

$-3x \quad -3x$

$\frac{2y}{2} = \frac{-3x}{2} + \frac{4}{2}$

$y = -\frac{3}{2}x + 2$

x		y
-4	$-\frac{3}{2}(-4) + 2$, $6 + 2$	8
-2	$-\frac{3}{2}(-2) + 2$, $3 + 2$	5
0	$-\frac{3}{2}(0) + 2$, $0 + 2$	2
2	$-\frac{3}{2}(2) + 2$, $-3 + 2$	-1



Example 9

Draw the graph of $2x - 5y = 8$.

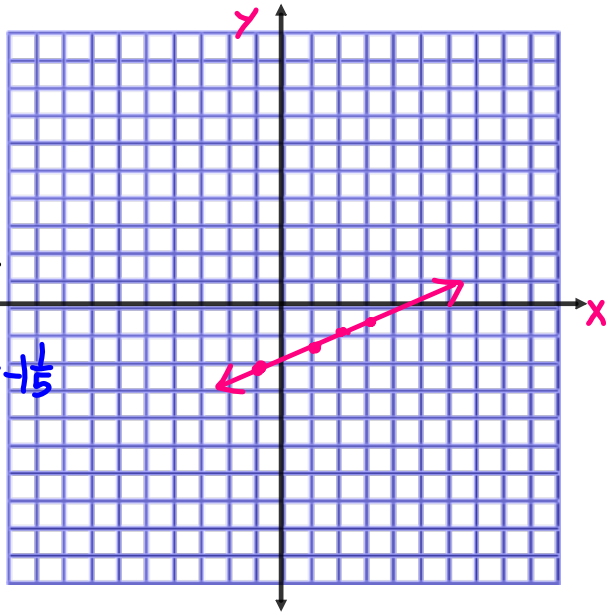
$2x - 5y = 8$

$-2x \quad -2x$

$\frac{-5y}{-5} = \frac{-2x + 8}{-5}$

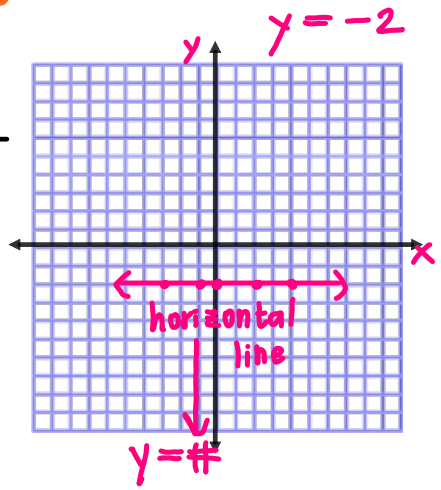
$y = \frac{-2x + 8}{-5}$

x		y
-1	$\frac{-2(-1) + 8}{-5} = \frac{2+8}{-5} = \frac{10}{-5}$	-2
1	$\frac{-2(1) + 8}{-5} = \frac{-2+8}{-5} = \frac{6}{-5}$	$-\frac{6}{5} = -1\frac{1}{5}$
2	$\frac{-2(2) + 8}{-5} = \frac{-4+8}{-5} = \frac{4}{-5}$	$-\frac{4}{5}$
3	$\frac{-2(3) + 8}{-5} = \frac{-6+8}{-5} = \frac{2}{-5}$	$-\frac{2}{5}$

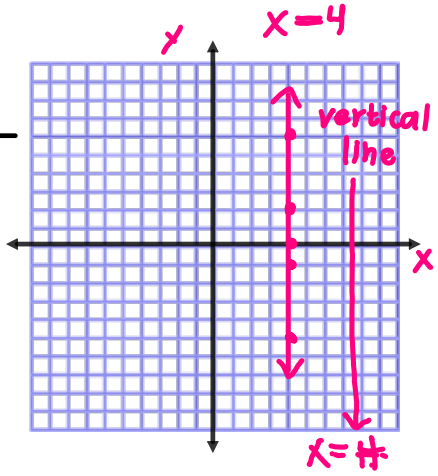


What would your graph look like if your table of values looked like these?

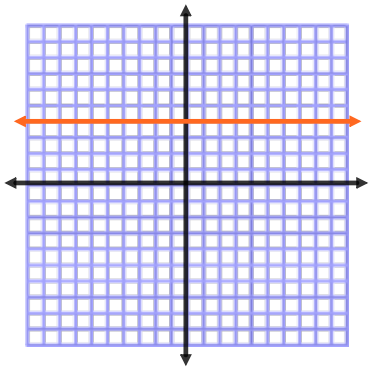
x	y
-3	-2
-1	-2
0	-2
2	-2
4	-2



x	y
4	-5
4	-1
4	0
4	2
4	6

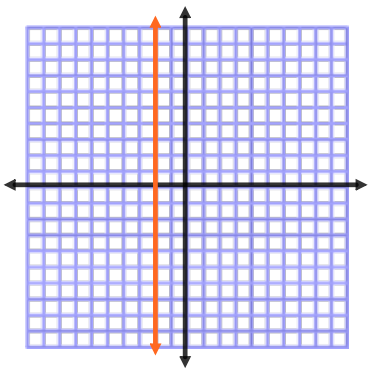


Horizontal Lines



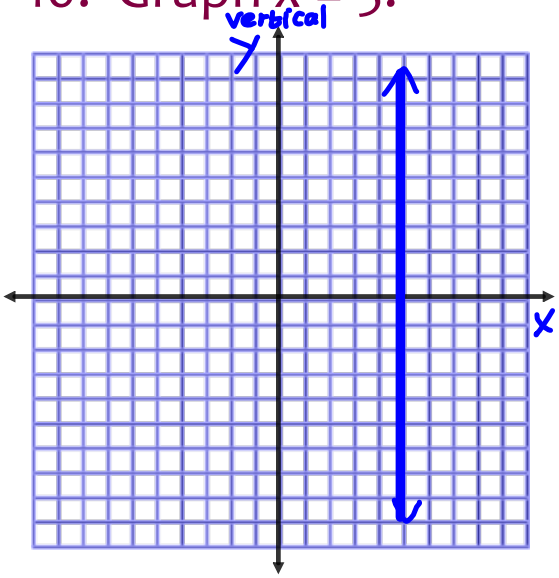
In the coordinate plane, the graph of $y = b$ is a ***horizontal line***.

Vertical Lines

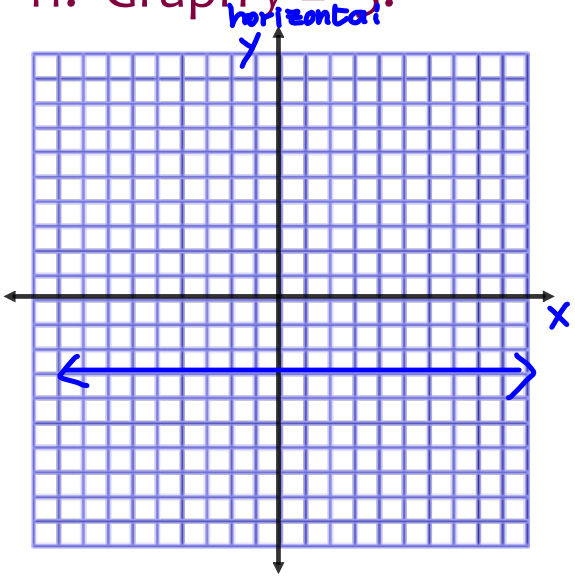


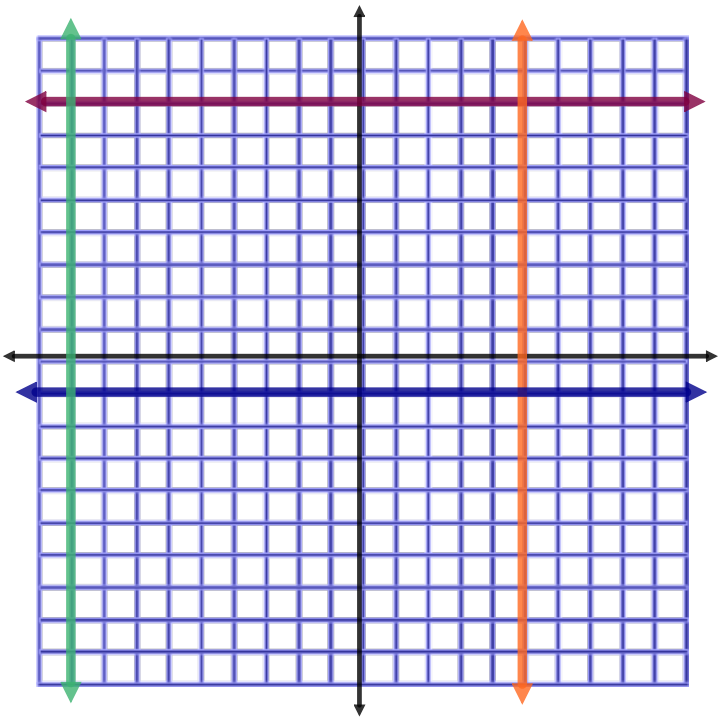
In the coordinate plane, the graph of $x = a$ is a ***vertical line***.

10. Graph $x = 5$.



11. Graph $y = -3$.





Write the equation of the...

12. maroon line

$y = 8$

13. orange line

$x = 5$

14. green line

$x = -9$

15. blue line

$y = -1$